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PART I

DRAFT BIOVENTING TEST WORK PLAN FOR FIRE TRAINING PIT 2 AND 3 (FT-002) PLATTSBURGH AFB, NEW YORK

Prepared For

Air Force Center for Environmental Excellence
Brooks AFB, Texas

and

380th Civil Engineering Squadron and
Environmental Management Branch
Plattsburgh AFB, New York

ES ENGINEERING-SCIENCE

ES
Engineering-Science, Inc.
1700 BROADWAY, SUITE 900
DENVER, COLORADO 80290

June1992

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PART I
DRAFT BIOVENTING TEST WORK PLAN FOR FIRE TRAINING PIT 2 AND 3 (FT-002) PLATTSBURGH AFB, NEW YORK

Prepared for:

Air Force Center for Environmental Excellence
Brooks AFB, Texas

and

380th Civil Engineering Squadron and
Environmental Management Branch
Plattsburgh AFB, New York

by:

Engineering-Science, Inc.
1700 Broadway, Suite 900
Denver, Colorado

June 1992

CONTENTS

FIGURES

BIOVENTING TEST WORK PLAN
FOR FIRE TRAINING PIT 2 AND PIT 3
(FIRE TRAINING AREA - 002)
PLATTSBURGH AFB, NEW YORK

1.0 INTRODUCTION

This test work plan presents the scope of an *in situ* bioventing pilot test for treatment of fuel contaminated soils within Fire Training Area - 002 (FT -002) at Fire Training Pits (FTP) 2 and 3 on Plattsburgh AFB, NY. The pilot tests have three primary objectives: 1) to assess the potential for supplying oxygen throughout the contaminated soil depth, 2) to determine the rate at which indigenous microorganisms will degrade fuel when stimulated by oxygen rich soil gas, 3) to evaluate the potential for sustaining these rates of biodegradation until fuel contamination is remediated below regulatory standards.

Pilot testing will consist of two phases, an initial air permeability and *in situ* respiration test which will take place in July of 1992, and an extended one year pilot test which will be used to determine the potential for bioventing remediation using natural nutrient levels. The extended test will also provide an estimate of cold weather biodegradation rates. The initial and extended pilot test will serve as treatability studies under the CERCLA feasibility study process. If bioventing proves to be feasible at these sites, pilot test data will be used to design a full-scale remediation system and to estimate the time required for site cleanup.

The initial test will involve air injection at a vent well located in the center of FTP3 using a positive displacement blower to produce a radius of influence of approximately 80-100 feet. *In situ* rates of fuel biodegradation and soil gas permeability will be determined during this short-term test and a decision on how best to proceed with extended testing will be made with regulatory concurrence.

Additional background information on the development and recent success of the bioventing technology is found in the attached document entitled "Test Plan and Technical Protocol For A Field Treatability Test For Bioventing." This protocol document will also serve as the primary reference for pilot test well designs and detailed procedures which will be used during the test.

2.0 SITE DESCRIPTION

2.1 Fire Training Pit Area - 002

2.1.1 Site Location and History

Fire Training Area - 002 (FT-002) is located approximately 500 feet west of the runway, approximately 500 feet east of the Plattsburgh AFB boundary, south of landfill LF-022 and north of LF-023. The site is located on a land surface which slopes gently toward the Saranac and Salmon Rivers located approximately 1.9 miles east of the site (Figure 2.1). Four bermed pits are located at the site ranging from approximately 60 to 160 feet in diameter. The majority of the soil contamination on the site is beneath and adjacent to Pit 1, the smaller of these bermed pits. Figure 2.2 shows the location of the pits in relation to Perimeter Road.

Fire training exercises were conducted at this site from the middle to late 1950s and continued until the site was permanently closed on May 22, 1989. Typically, the bottom of the pit was saturated with water and then filled with a layer of jet fuel and then ignited. Fire fighters would practice extinguishing the flames which generally surrounded a mock metal aircraft in the pit. Unburned fuel soaked into the ground creating the contaminated soil column now found beneath the pit. In 1980, cement-stabilized soil liners were added to Pits 2 and 3 which were active at that time; Pits 1 and 4 had been deactivated. Prior to strict environmental regulations, solvents and other chemicals were sometimes mixed with the fuel and placed in the pit for burning. Some fuel and noncombustible fluids seeped into the soil beneath the unlined pits or leaked through cracks in the lined pits. The resulting hydrocarbon contamination and minor solvent contamination found at this site are the targets for bioventing treatment.

2.1.2 Site Geology

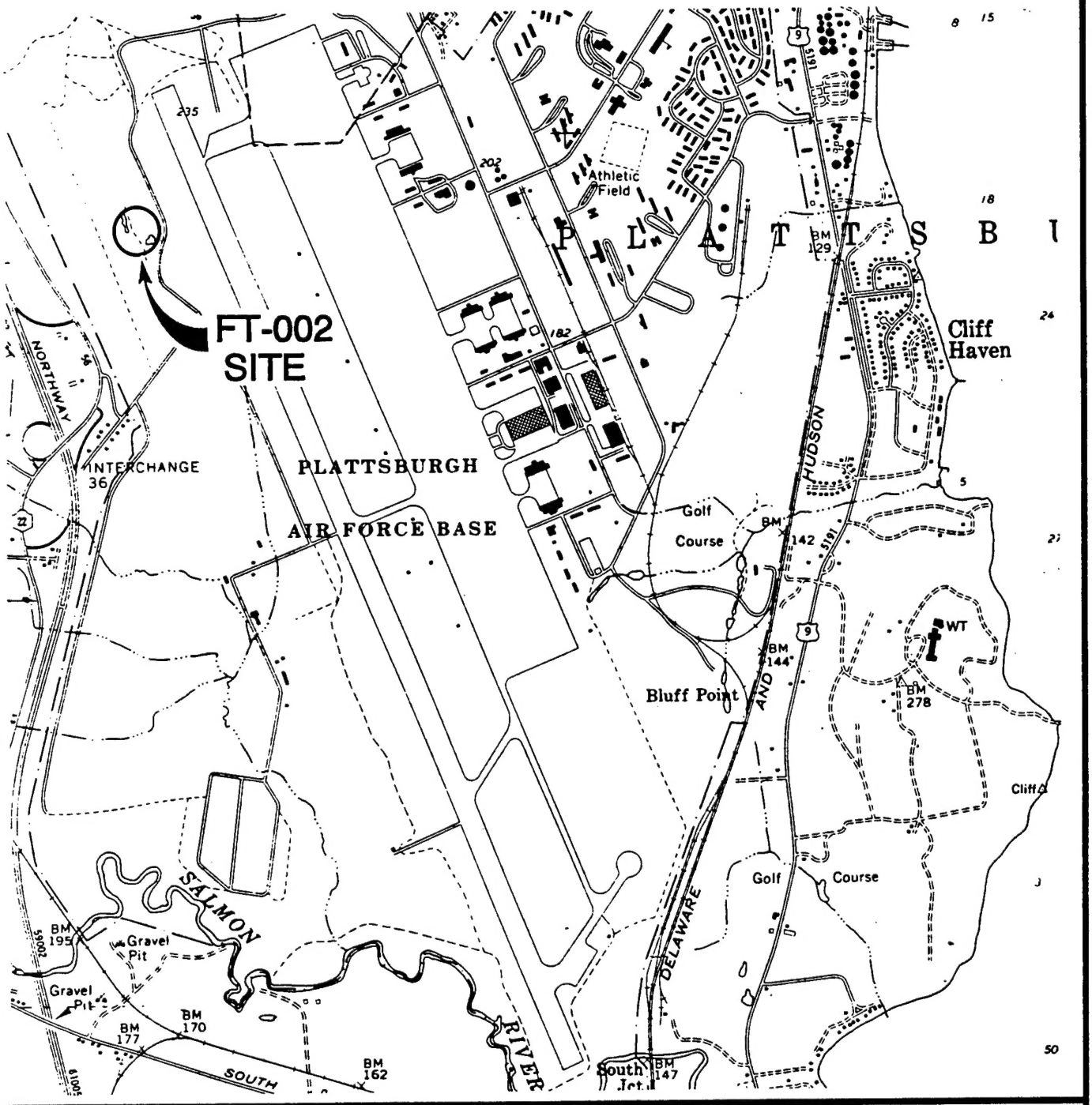
Because the bioventing technology is applied to the unsaturated soils, this section will primarily address soils above the shallow aquifer. Soils at this site consist of Pleistocene marine deposits which results in uniform layers of sand and clay overlying till and carbonate bedrock. Ground water is encountered within the sand in the area of the pits at a depth of approximately 32 to 35 feet and generally flows southeasterly toward the Salmon River.

Due to the homogeneous nature of the sand, the permeability of soils to air flow should remain relatively constant across the site. Effective bioventing on this site is likely. Engineering-Science has completed successful bioventing projects within similar geological deposits and we are confident that oxygen can be distributed in these soils. To monitor the bioventing pilot test, soil vapor monitoring points will be positioned in six locations in and between Pits 2 and 3 at three depths to study the subsurface oxygen distribution and to measure in situ respiration rates.

2.1.3 Site Contaminants

The primary contaminants on this site are fuel residuals which have migrated to a depth of approximately 35 feet where the maximum depth to groundwater is encountered (in the area of Pits 2 and 3). Free product has been observed in

FIGURE 2.1



BASE MAP : U.S.G.S. 7.5 TOPOGRAPHIC MAP
(QUADRANGLE)PLATTSBURGH, NEW YORK

SCALE
0 2000 4000 FT.

LATITUDE : 44° 37' 30" N
LONGITUDE : 73° 30' 00" W

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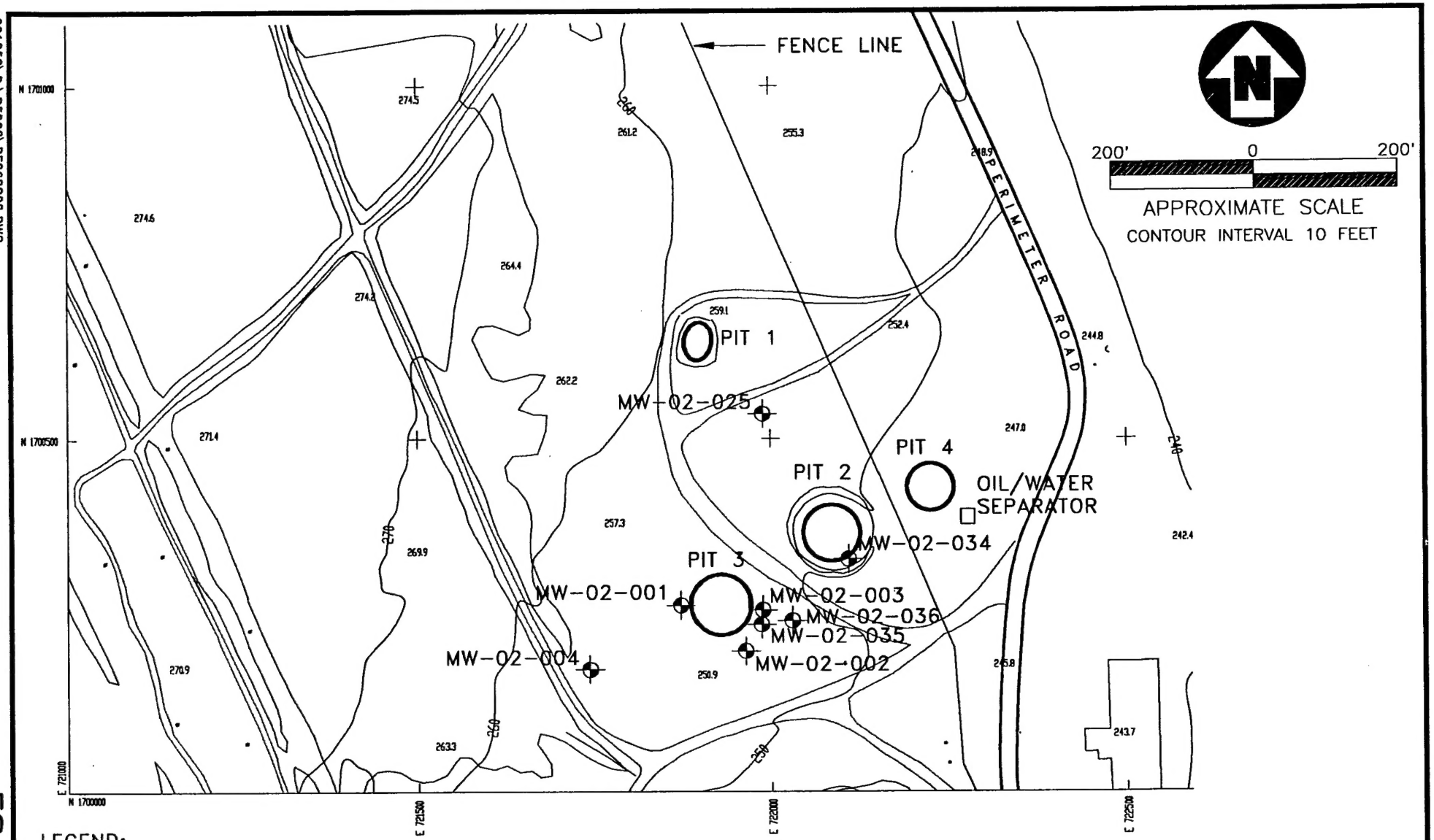
SITE LOCATION MAP

PLATTSBURGH AFB
Plattsburgh, New York



SITE PLAN

PLATTSBURGH AFB
Plattsburgh, New York

FIGURE 2.2

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monitoring wells on the site near Pit 1 and 4 but not beneath pits 2 and 3. Figure 2.3 shows a typical cross-section across the center of the site (ABB Environmental Services, 1992).

Hydrocarbon contamination in the soils were detected in Pits 2 and 3 at a concentration of less than 10,000 mg/kg. Chlorinated solvents such as Trichloroethene and Dichloroethene compounds are found in site soils at a maximum concentration of 380 mg/kg. Due to the short duration of the initial air permeability and *in situ* respiration tests at FTP 2, little or no change in contaminant levels will occur. The extended bioventing test could result in a 20% reduction in fuel residual concentrations based on full-scale bioventing results at similar sites. Some cometabolic biodegradation of DCE and TCE is also expected at this site, but will not be specifically monitored.

3.0 SITE SPECIFIC ACTIVITIES

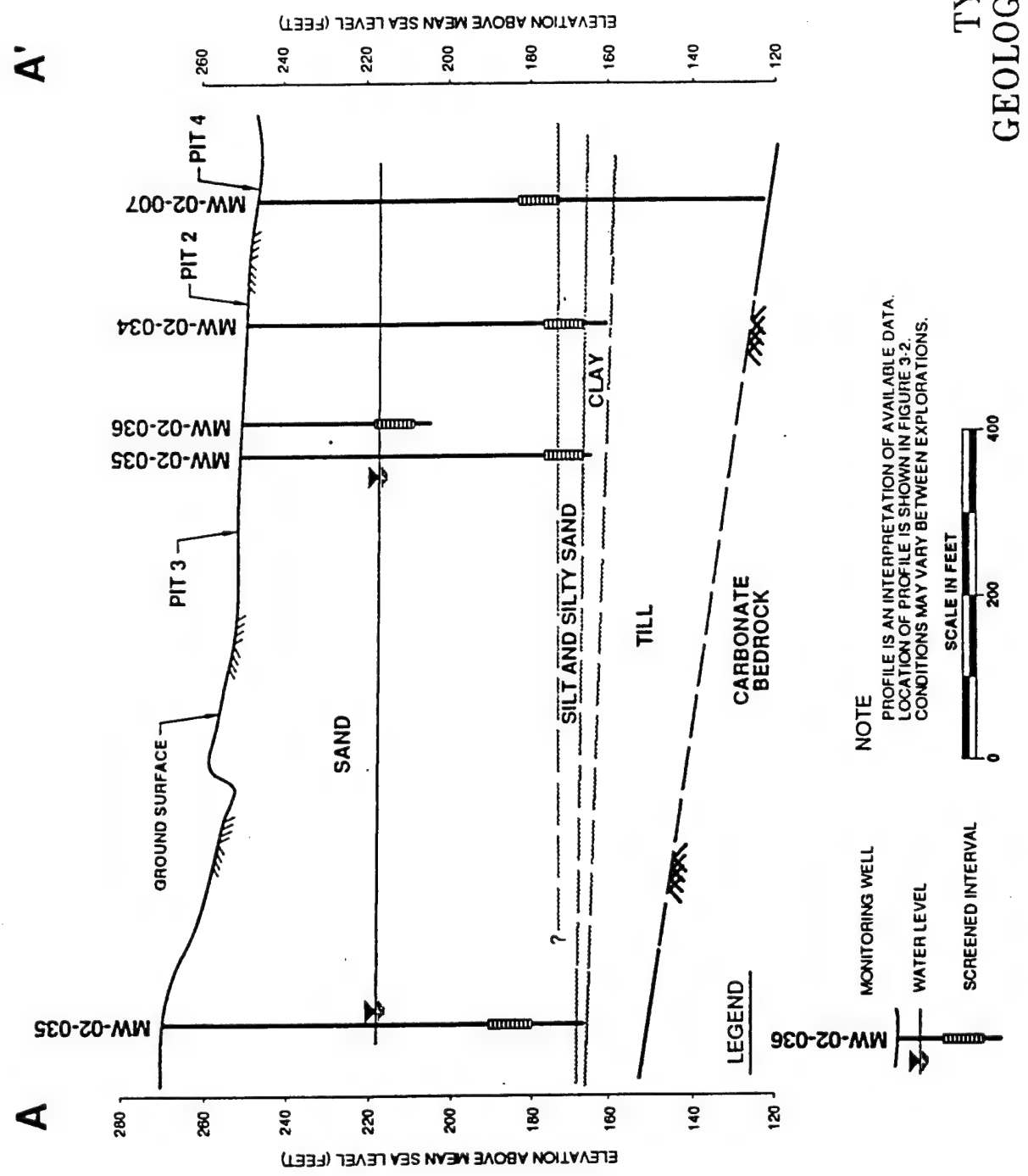
The purpose of this section is to describe the proposed location of two vent wells and four vapor monitoring points at FTP 2 and 3. Soil sampling procedures and the blower configuration that will be used to inject air (oxygen) into contaminated soils are also discussed in this section. In an effort to be as cost effective as possible, and because Pits 2 and 3 are less than 200 feet apart, a single vent well will be completed in the center of each pit. However, the initial pilot test will be conducted only at the vent well in Pit 3. Based on the results of the pilot test, the vent well in Pit 2 may be connected to the blower system in order to utilize both vent wells for the extended pilot test. Pilot test activities will be confined to unsaturated soils remediation; no dewatering will take place during the pilot tests. Existing groundwater monitoring wells will not be used as primary air injection or extraction wells. However, monitoring wells which have a portion of their screened interval above the water table may be used as vapor monitoring points or to measure the composition of background soil gas.

3.1 Fire Training Pit 2 and 3

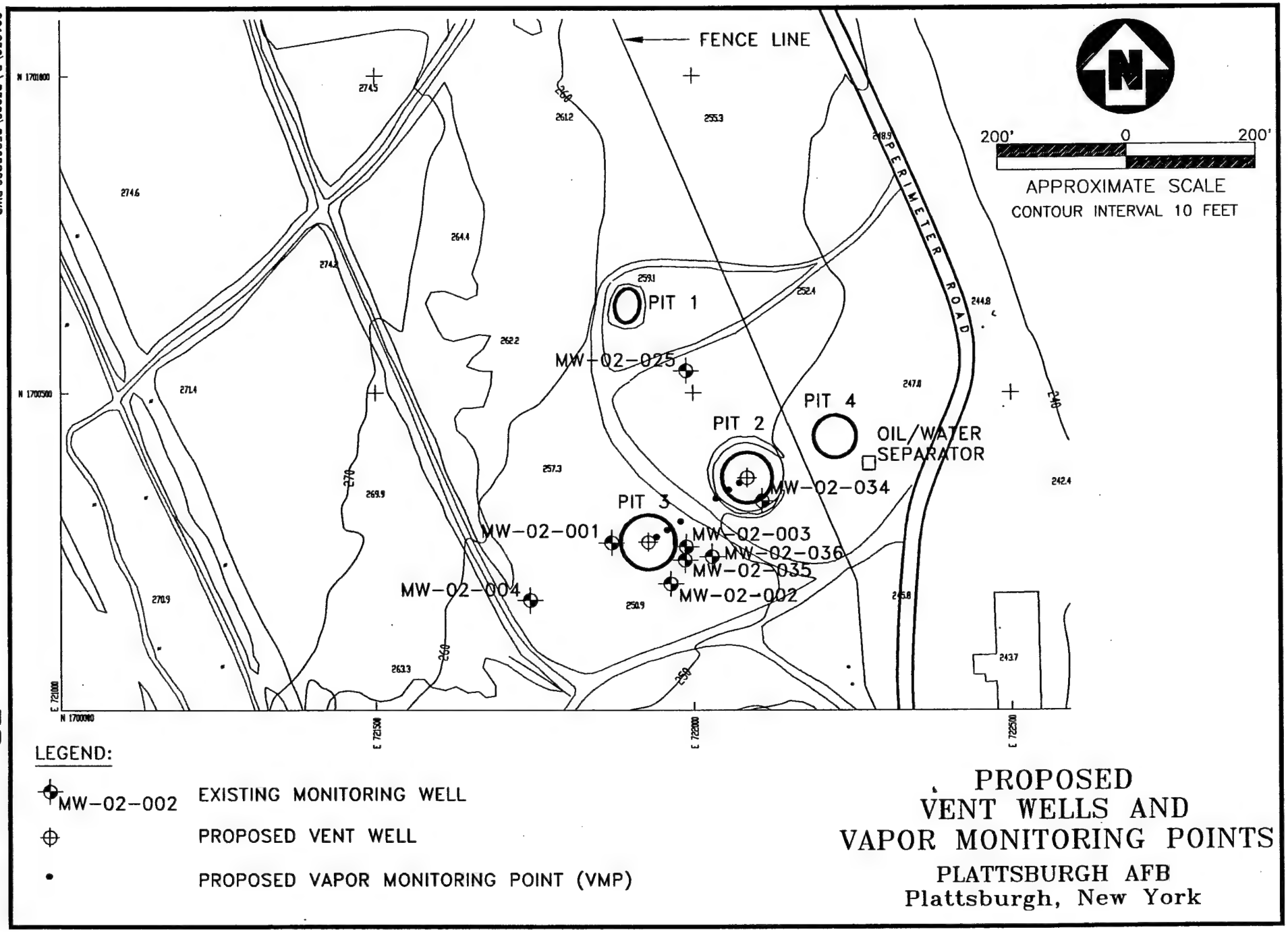
A general description of criteria for siting venting wells in each of the pits and associated vapor monitoring points are included in the attached protocol. Figure 3.1 illustrates the proposed locations of the central vent well and monitoring points at the pit. The final location of these wells may vary slightly from the proposed location if significant fuel contamination is not observed in the boring for the central vent well. Based on site investigation data, each of the vent wells will be located just off the center of the bermed fire training pits. These areas are expected to have an average TPH concentration exceeding 8000 mg/kg. Soils in this area are expected to be oxygen depleted (< 2%) and increased biological activity should be stimulated by oxygen-rich soil gas ventilation during full-scale operations.

Due to the relatively deep depth of contamination at this site and the potential for moderate to high permeability soils, the radius of venting influence around the central air injection well is expected to exceed 60 feet. Three vapor monitoring points will be located within a 60-foot radius of the central vent well in both pits. However, initial injection testing will occur at only the Pit 3 vent well. Monitoring

FIGURE 2.3



(FROM ABB ENVIRONMENTAL SERVICES, INC., 1992)



PROPOSED VENT WELLS AND VAPOR MONITORING POINTS

PLATTSBURGH AFB
Plattsburgh, New York

FIGURE 3.1

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well MW-02-004 may be used for a background monitoring point if the screened interval extends several feet above the water table. The background well will be used to measure background levels of oxygen and carbon dioxide and to determine if natural carbon sources are contributing to oxygen uptake during the *in situ* respiration test. If MW-02-004 cannot be used, a seventh vapor monitoring point will be completed approximately 300 feet west of Pit 3. Additional details on the *in situ* respiration test are found in Section 5.7 of the attached protocol document.

The vent wells will be constructed of 4-inch ID Schedule 40 PVC, with a 25 foot interval of 0.04 slotted screen set between 15 and 40 feet below ground surface (the deepest seasonal groundwater elevation). Flush-threaded PVC casing and screen will be used with no organic solvents or glues. The filter pack will be clean, well-rounded silica sand with a 6-9 grain size and will be placed in the annular space of the screened interval. A 3-foot layer of bentonite will be placed directly over the filter pack. The first 6 inches of bentonite will consist of bentonite pellets hydrated in place with potable water. This layer of pellets will prevent the addition of bentonite slurry from saturating the filter pack. The remaining 2.5 feet of bentonite will be fully hydrated and mixed above ground and the slurry tremied into the annular space to produce an air tight seal above the screened interval. A complete seal is critical to prevent injected air from short-circuiting to the surface during the bioventing test. Figure 3.2 illustrates the proposed central vent well construction for this site.

A typical multi-depth vapor monitoring point installation for this site is shown in Figure 3.3. Soil gas oxygen and carbon dioxide concentrations will be monitored at depth intervals of approximately 7 - 8 feet, 19 - 20 and 31 - 32 feet at each location. Multi-depth monitoring will confirm that the entire soil profile is receiving oxygen and will be used to measure fuel biodegradation rates at all depths. The annular space between these two monitoring points will be sealed with bentonite to isolate the monitoring intervals. As with the central vent well, several inches of bentonite pellets will be used to shield the filter pack from rapid infiltration of bentonite slurry additions. Additional details on vent well and monitoring point construction are found in Section 4 of the protocol document.

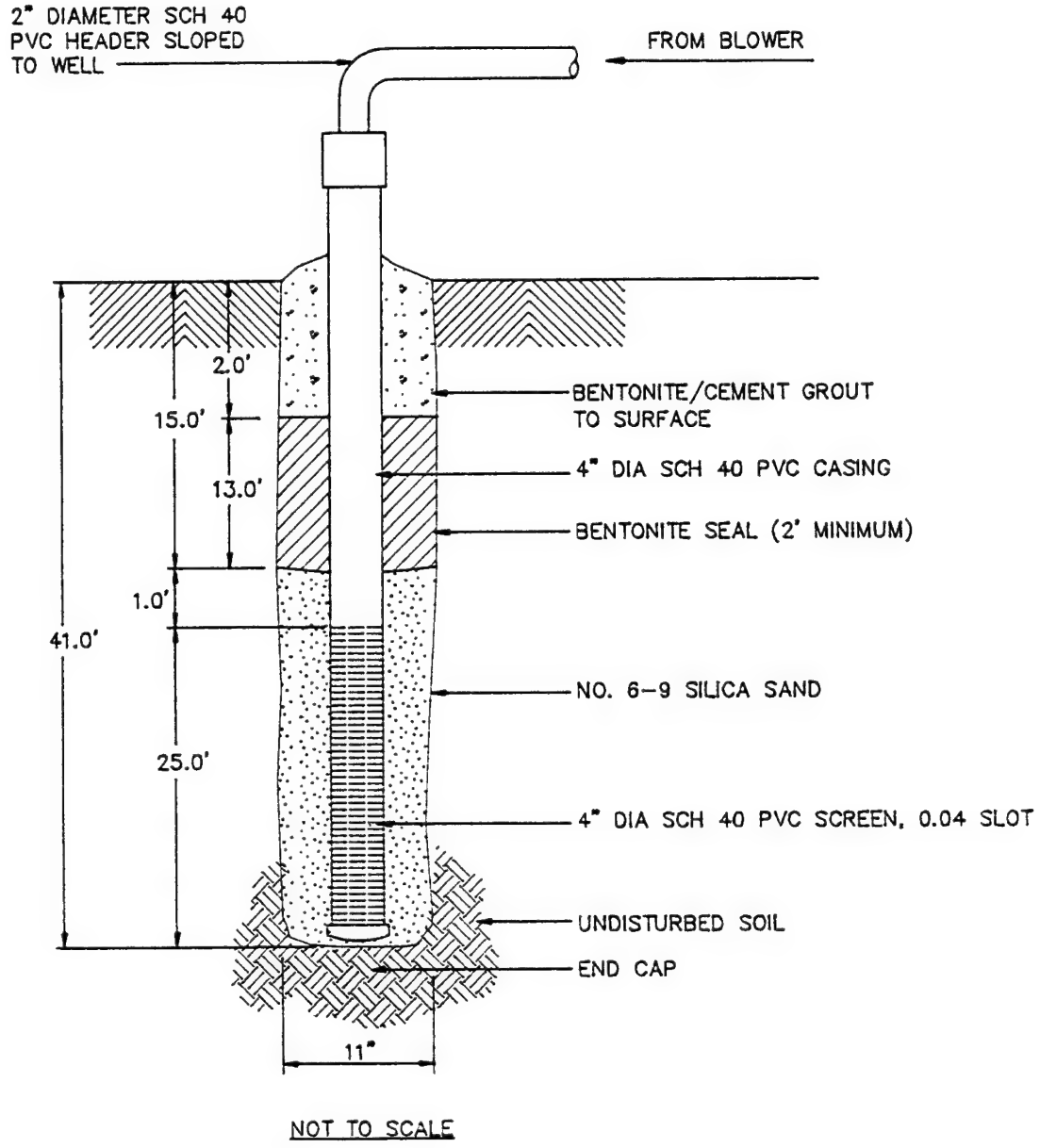
3.2 Handling of Drill Cuttings

Drill cuttings from all borings will be left at each location in accordance with the current procedures for ongoing remedial investigations.

3.3 Soil Sampling

Four soil samples will be collected from the pilot test area during the installation of the vent well and monitoring points. One sample will be collected from the most contaminated interval of each central vent well boring, one sample will be collected from the interval of highest apparent contamination in borings from two vapor monitoring points at the site. Soil samples will be analyzed for TPH, BTEX, soil moisture, pH, particle sizing, alkalinity, total iron and nutrients.

Samples will be collected using a split-spoon sampler containing brass tube liners. A photoionization detector or total hydrocarbon vapor analyzer (see protocol



NOT TO SCALE

FIGURE 3.2

FIRE TRAINING AREA (FT. -002)
PITS 2 AND 3
INJECTION VENTING WELL
CONSTRUCTION

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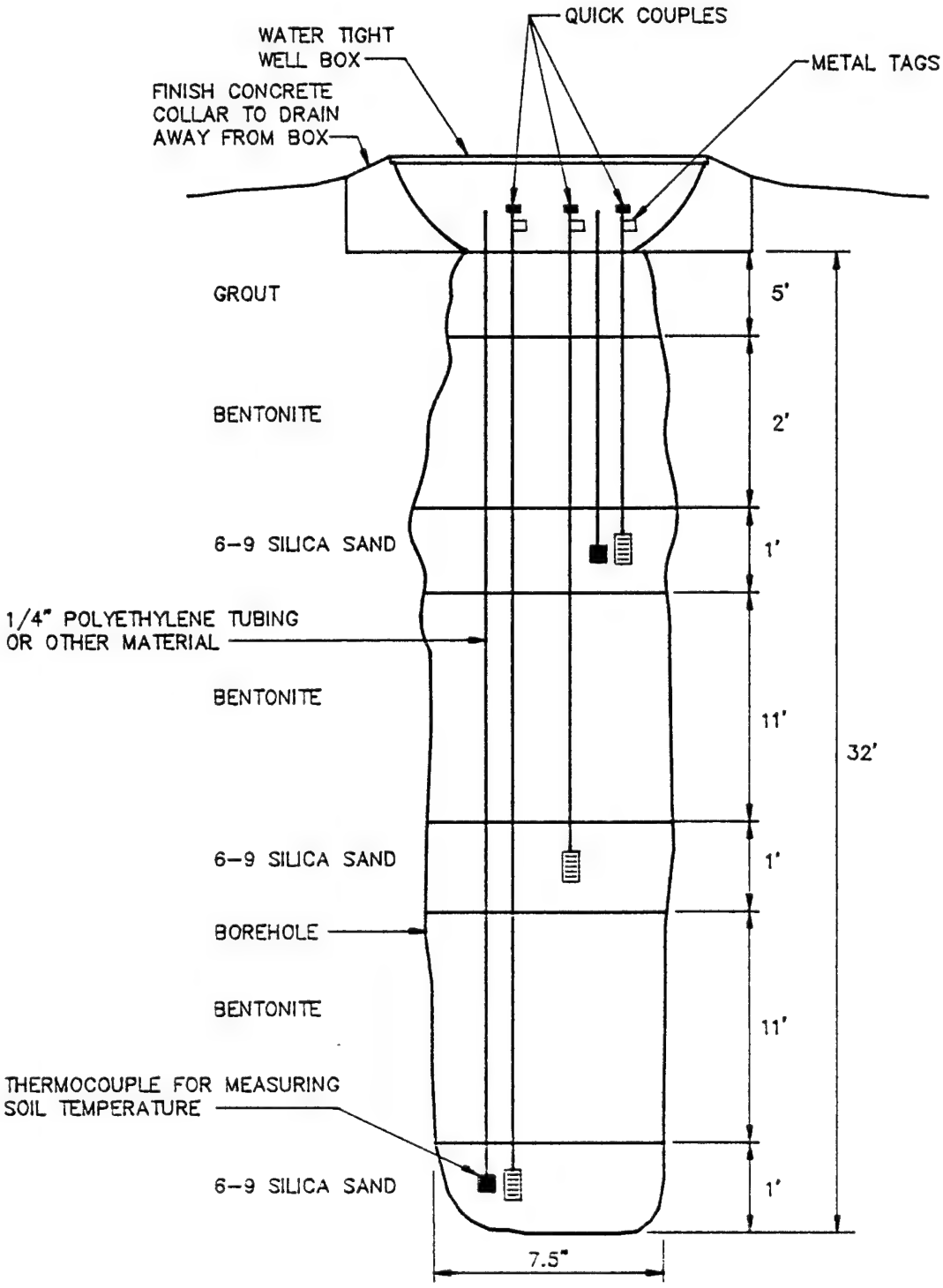


FIGURE 3.3

FIRE TRAINING AREA (FT. -002)
PITS 2 AND 3
MONITORING POINT
CONSTRUCTION DETAIL

PLATTSBURGH A.F.B., NEW YORK

ENGINEERING-SCIENCE, INC.
Syracuse, New York

26812-01, 06/16/92 at 08:43

Section 4.5.2) will be used to insure that breathing zone levels of volatiles do not exceed 1 ppm during drilling and to screen split spoon samples for intervals of high fuel contamination. Soil samples collected in the brass tubes will be immediately trimmed and aluminum foil and a plastic cap placed over the ends. Soil samples will be labelled following the nomenclature specified in the protocol document(Section 5.5), wrapped in plastic, and placed in an ice chest for shipment. A chain of custody form will be filled out and the ice chest shipped to the Engineering Science laboratory in Berkeley, California for analysis. This laboratory has been audited by the U.S. Air Force and meets all quality assurance/quality control and certification requirements for the State of New York.

3.4 Blower System

A 3HP blower capable of injecting 30 - 90 scfm will be used to conduct the initial air permeability test at these sites. This blower provides a wide range of flow rates and should develop sufficient pressure to move air through moderate to high permeability soils. Air injection will be used to provide oxygen to soil bacteria and to minimize emissions of volatiles to the atmosphere. If initial testing indicates that less pressure is required to supply oxygen throughout the test volume, a smaller blower will be installed for extended pilot testing at the site.

An extended pilot test will be performed at FTP 2 and 3 if initial pilot testing is positive. The extended bioventing test will be initiated following regulatory approval. Figure 3.4 is a schematic of a typical air injection system that will be used for pilot testing at these sites.

The maximum power requirement anticipated for this pilot test is a 230-Volt, Single-Phase, 50 Amp service. Additional details on power supply requirements are described in Section 5.0, Base Support Requirements.

4.0 EXCEPTIONS TO PROTOCOL PROCEDURES

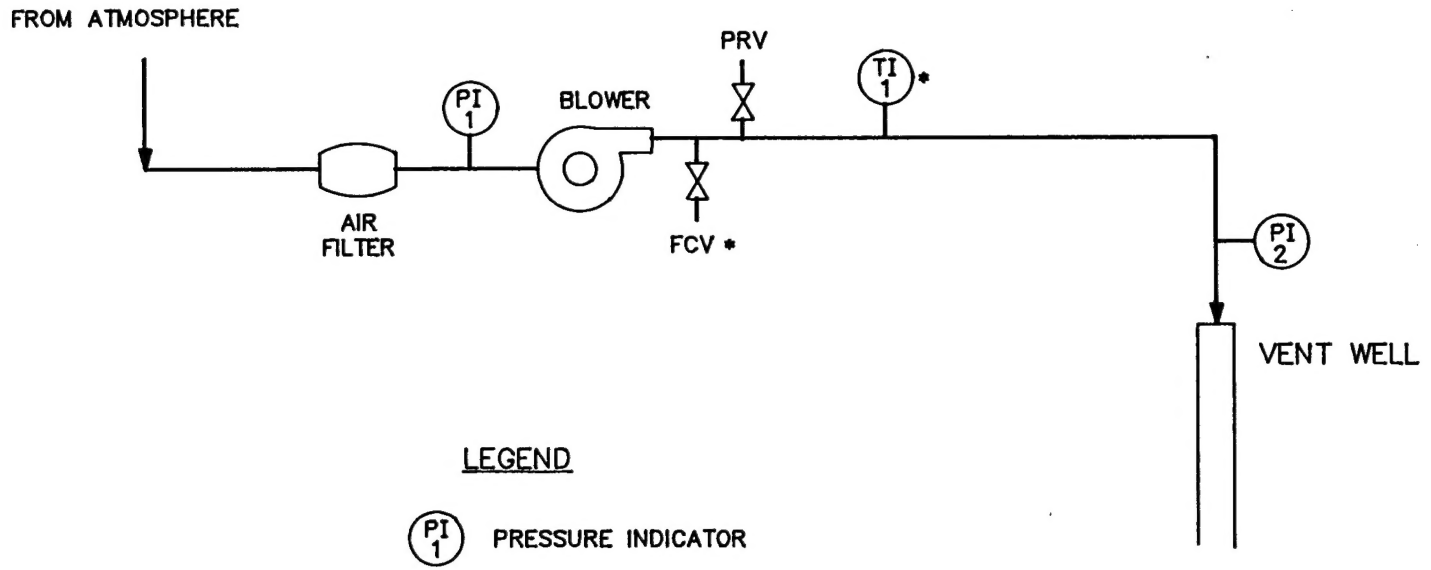
The procedures that will be used to measure the air permeability of the soil and *in situ* respiration rates are described in Sections 4 and 5 of the attached protocol document. No exceptions to this protocol are anticipated.

5.0 BASE SUPPORT REQUIREMENTS

5.1 Test Preparation

The following base support is needed prior to the arrival of a driller and the Engineering-Science test team:

- Assistance in obtaining a digging permit at the site.
- A breaker box or generator within 100 feet of the site which can supply 230 Volt, Single-Phase, 50 Amp service for the initial and extended pilot test.
- Provide any paperwork required to obtain gate passes and security badges for approximately three Engineering Science employees and two drillers. Vehicle passes will be needed for two trucks and a drill rig.



LEGEND

PI 1	PRESSURE INDICATOR
TI 1	TEMPERATURE INDICATOR
FCV	FLOW CONTROL VALVE
PRV	PRESSURE RELIEF VALVE
*	OPTIONAL

FIGURE 3.4

BLOWER SYSTEM INSTRUMENTATION DIAGRAM FOR AIR INJECTION

PLATTSBURGH A.F.B., NEW YORK

ENGINEERING–SCIENCE, INC.
Syracuse, New York

ES

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During the initial three week pilot test the following base support is needed:

- Twelve square feet of desk space and a telephone in a building located as near to the site as practical.
- The use of a fax machine for transmitting 15 to 20 pages of test results.

During the one year extended pilot test:

- Check the blower system at FT-002 at least once a week to ensure that it is operating and to record the air injection pressure. Change the inlet air filter approximately once per month. Engineering-Science will provide a brief training session on these procedures.
- Notify Mr. Richard Moravec ES-Syracuse (315) 451-9560, Mr Doug Downey or Ms Gail Saxton ES-Denver (303) 831-8100, or Mr. Jim Williams of the AFCEE (800) 821-4528 ext 293, if the blower or motor stop working.
- Arrange site access for an Engineering-Science technician to conduct *in situ* respiration tests approximately six months and one year after the initial pilot test.

6.0 PROJECT SCHEDULE

The following schedule is contingent upon timely approval of this pilot test work plan.

Event	Date
Draft Test Work Plan to AFCEE/380 SPTG/DEV	19 Jun 1992
Air Force Approval To Proceed	26 Jun 1992
Begin Initial Pilot Test	13 Jul 1992
Complete Initial Pilot Test	29 Jul 1992
Interim Results Report to AFCEE//380SPTG/DEV	2 Sept 1992
Submit Test Work Plan/Interim Results to Regulators	16 Sept 1992
Begin Extended Testing	1 Oct 1992
Respiration Test	April 1993
Final Respiration Test/Soil Sampling	Sept 1993

Bioventing Testing At Additional Sites:

Following a review of the initial pilot test results, 380 SPTG/DEV and AFCEE will make a decision on how to proceed with extended pilot testing at FTP 2 and 3 and other applicable sites.

7.0 POINTS OF CONTACT

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